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(71) Applicant  
Wyatt Gates  
Brook Cottage, Ramsdeil, Nr Basingstoke, Hampshire,  
United Kingdom

(72) Inventor  
Wyatt Gates

(74) Agent and/or Address for Service  
R G C Jenkins & Co  
28 Caxton Street, London, SW1H 0RJ, United Kingdom

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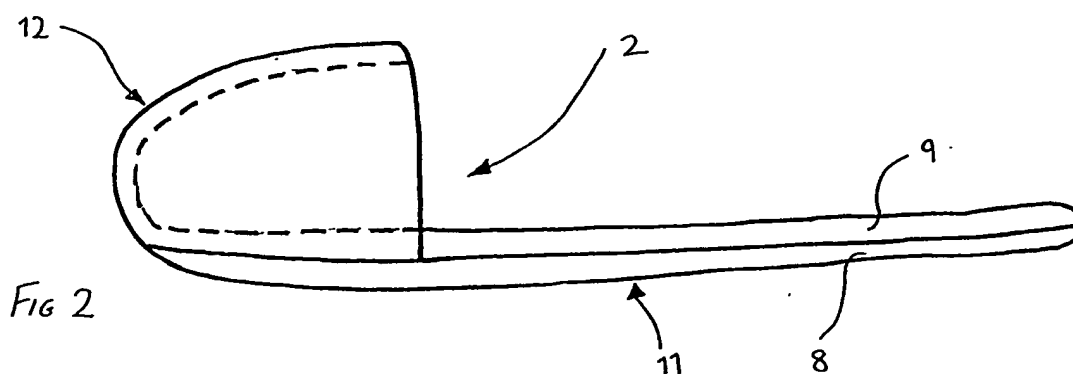
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(56) Documents cited  
GB 2205480 A GB 2009587 A GB 1258199 A  
GB 1220846 A GB 0756589 A EP 0239313 A

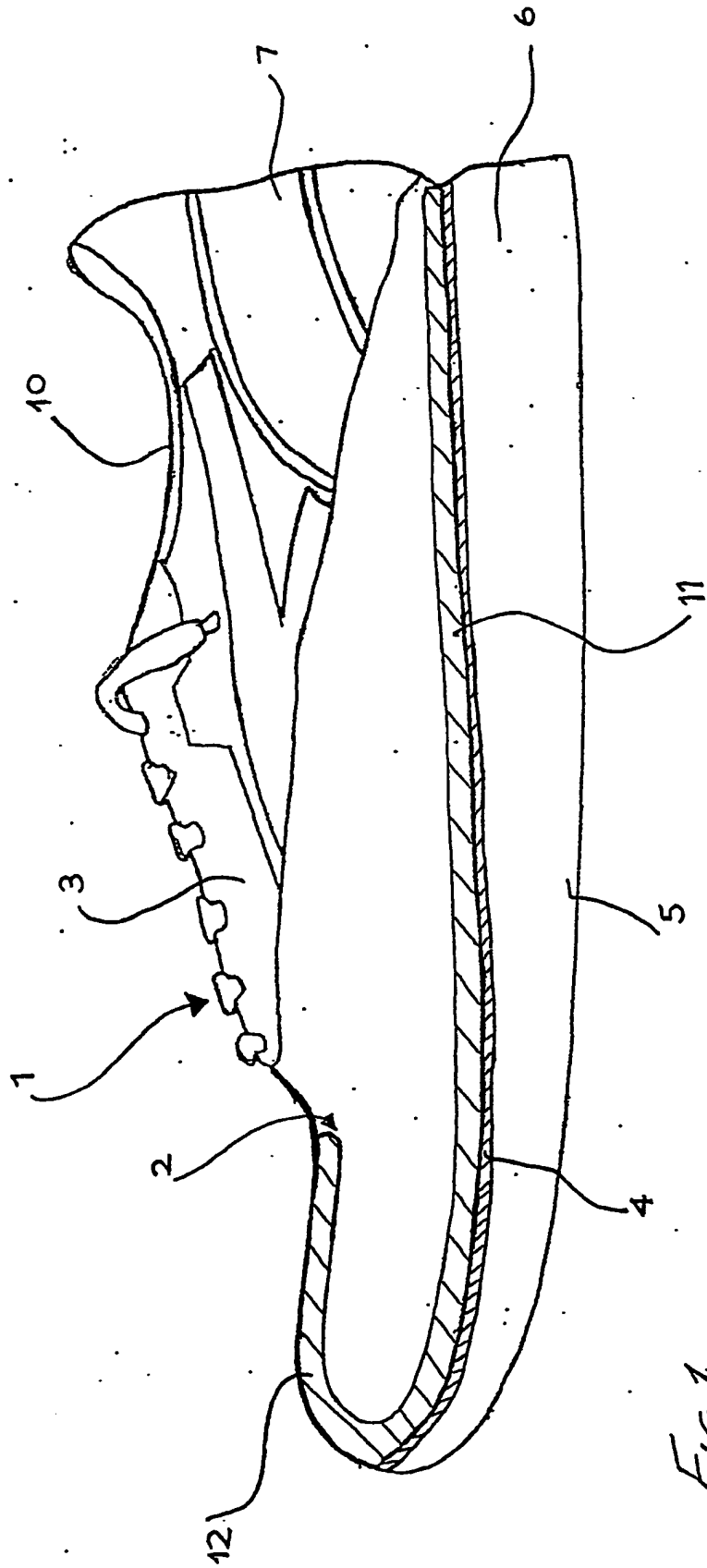
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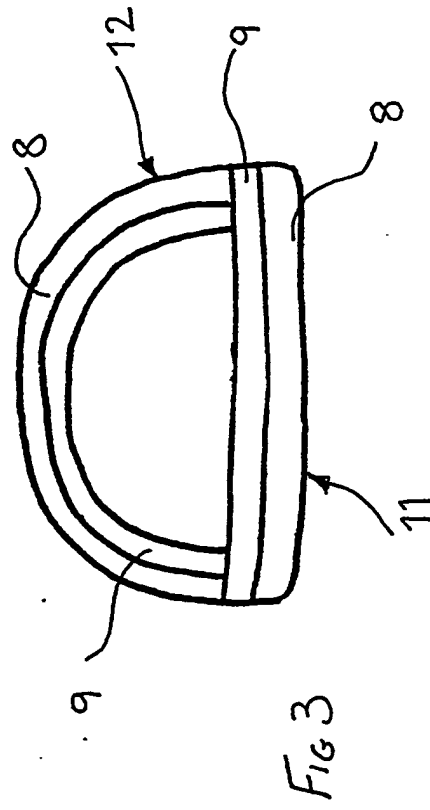
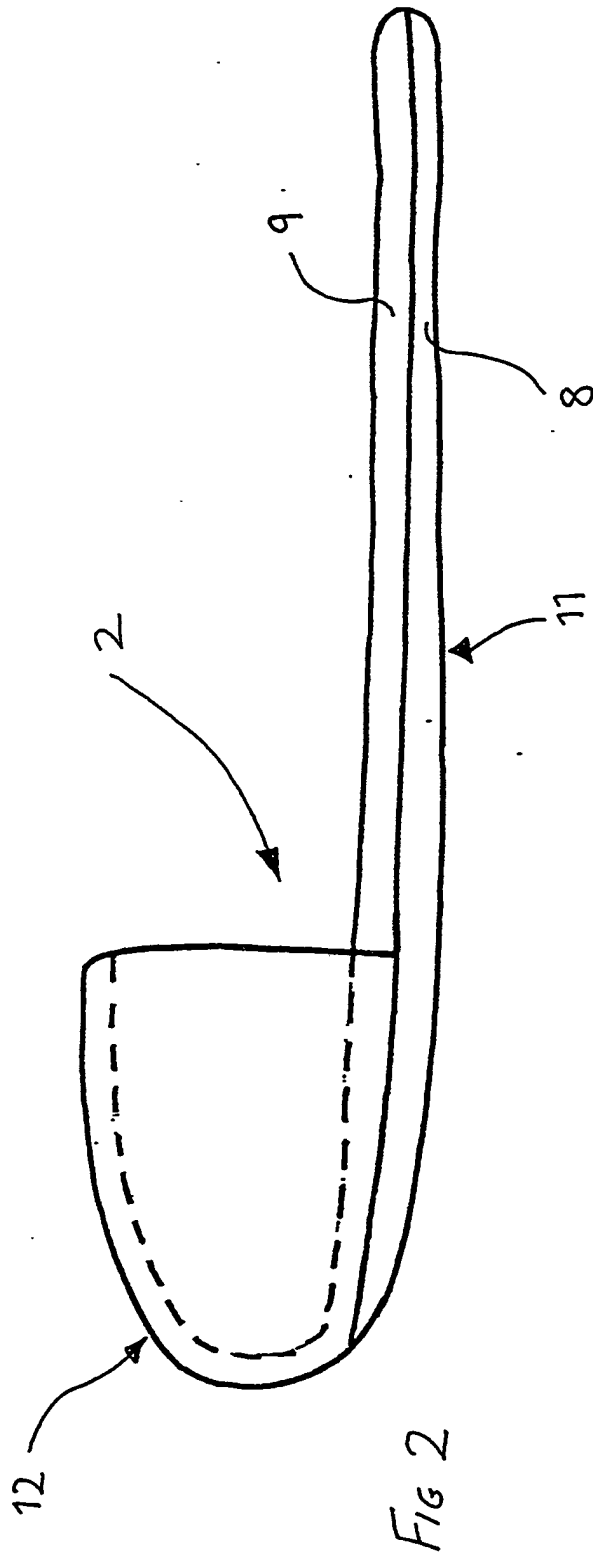
(54) Reinforcement device for footwear

(57) A reinforcement device 2 removably insertable into a shoe or boot and particularly suitable for a trainer provides resistance against penetration and/or crushing of the shoe, boot or trainer. The device may be of steel, fibre reinforced material, chain mail or fibre reinforced mesh.



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## A REINFORCEMENT DEVICE

This invention relates to reinforcement devices for shoes or boots providing resistance against penetration and or crushing of the shoe or boot.

5           The risk of receiving foot injuries is considerable for workers in some industries where sharp objects such as screws, nails or metal offcuts may be encountered on the ground or where heavy objects are transported from place to place. These  
10       injuries are typically either by crushing particularly of the toes due to falling objects or incision by sharp objects which penetrate the sole of the shoe or boot worn by the worker. There are also many people working in jobs where foot injuries might not  
15       generally be expected or who engage in do-it-yourself activities who are occasionally at risk of receiving such injuries.

          While injury due to crushing of the foot may include broken bones which cause temporary discomfort,  
20       it is often the case that the crushing is so severe as to require amputation of the toes. A deep penetration wound creates anaerobic conditions in which tetanus and other anaerobes may grow, and since a wound to the foot is likely to be contaminated with soil and the  
25       like which is a known habitat of the tetanus bacteria,

there is a considerable risk of tetanus infection associated with this type of foot injury. Tetanus can be particularly serious and sometimes fatal.

5 It is possible to obtain so-called safety boots for protecting the feet against injury. These safety boots are typically provided with an integral reinforced toe cap and/or insole. Many manufacturers also produce safety shoes having an integral reinforced toe cap and/or insole. For the purposes of  
10 this specification any reference to a shoe hereinafter may be taken to include any form of boot or shoe. However, many workers do not favour safety shoes preferring instead so-called 'trainers' or similar lightweight shoes for reasons of either comfort or  
15 appearance. It would therefore be advantageous if a means could be provided for reinforcing trainers or other non-safety shoes so that they may have protective properties similar to a safety shoe.

With the above in mind, the present invention  
20 provides a reinforcement device removably insertable into a shoe or boot for providing resistance against penetration of and/or crushing of said shoe or boot.

It is to be understood that whilst the invention is particularly applicable to lightweight shoes such  
25 as 'trainers' it is also applicable to other shoes or boots.

The invention also includes a shoe or boot provided with a removably insertable reinforcement device as defined in the last but one preceding paragraph.

5           A reinforcement device according to the invention may comprise an insole or a toe cap. However, in a preferred embodiment, the reinforcement device comprises a toe cap and insole which are integral.

10           The insole of the reinforcement device comprises a penetration resistant layer which may be a sheet of a material such as steel or a fibre reinforced composite. Alternatively the penetration resistant layer may comprise a mesh which may be of a fibre reinforced material or chain-mail.

15           The insole may further include a layer of a substantially softer material arranged such that on insertion of the device into a shoe or boot the layer of softer material forms a contact surface for a foot of the wearer of the shoe or boot to generally improve  
20           the comfort thereof.

          In one embodiment of a reinforcement device, the penetration resistant layer of the insole may be arranged to extend from a toe end of the device to a mid-sole portion thereof so as to protect the toes and  
25           ball of the foot only.

          When provided, the toe cap may be crush

resistant, and in this case may preferably be made of steel. The toe cap may further include a lining of a softer material than steel.

5 In order that the invention may be well understood, an embodiment thereof, which is given by way of example only, will now be described with reference to the accompanying drawings, in which:

10 Figure 1 is a sectional view of a trainer provided with a removably insertable reinforcement device;

Figure 2 is a side view of the reinforcement device removed from the trainer; and

Figure 3 shows the same reinforcement device viewed from the heel end.

15 In Figure 1 there is shown a trainer 1 provided with a reinforcement device 2. The trainer generally comprises a sole 5 formed integrally with a heel 6, and an upper 3 which extends upwardly (as viewed in Figure 1) from the sole in conjunction with a heel cup 7 so as to form an enclosure having an opening 10 for receiving a foot. Typically an insole 4 is provided for the comfort of a wearer of the trainer.

20 The reinforcement device 2 is shown having been removably inserted into the trainer through the opening 10 and comprises an insole 11 and a toe cap 12 which are integral. As shown in Figures 2 and 3, the

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insole and toe cap each comprise two layers of material; a penetration resistant layer 8 and a layer 9 of a substantially softer material.

5 The penetration resistant layer 8 may be a sheet of material such as steel or a fibre reinforced composite, chain-mail or a fibre reinforced mesh. A suitable reinforcing fibre might for example be a polyaramid fibre such as KEVLAR (RTM). In the embodiment shown in Figure 2 layer 8 is a sheet of steel. The sheet of steel is substantially flat over the insole portion 11 of the device 2 and is turned back at one end thereof so as to form a cup-like enclosure which is the toe cap portion 12 of the device and is shaped so as to encase the toes of the wearer of the training shoe. The steel enclosure forming the toe cap 12 of the device is resistant to crushing so that in the event of the toe end of the trainer being subject to a crushing load up to a predetermined limit, the toe cap is not crushed so that the toes of the wearer are protected from crushing. In the event of a sharp object penetrating the sole 5 or heel 6 of the trainer it must further penetrate steel layer 8 of the insole 11 of the device before contacting the foot of the wearer. Thus the sole of the foot of the wearer of the trainer receives protection against incision by sharp objects.



Layer 9 of the integral insole 11 and toe cap 12 is provided to improve the comfort of the wearer of the training shoe fitted with the device. This layer of softer material extends over the insole portion 11 of the device such that it forms a contact surface for the sole of the foot of the wearer of the trainer and also covers the surface of the toe cap portion 12 so as to form a lining thereof. Layer 9 of the toe cap and insole may be attached to the steel layer 8 by an adhesive of any other suitable means.

It is to be understood that the above description of an embodiment of the reinforcement device is given by way of example only. For instance, the integral toe cap and insole may not be formed of single layers of material as described above, but may instead be separate components each formed of a penetration resistant layer and a substantially softer layer and joined by any suitable means so that the penetration resistant layer of the toe cap may be of a different material to the penetration resistant layer of the insole; for example, a sheet steel toe cap might be joined to a chain-mail insole. It is also to be understood that the substantially softer layer, although desirable for comfort, may be omitted.

CLAIMS:

1. A reinforcement device removably insertable into a shoe or boot for providing resistance against penetration of and/or crushing of said shoe or boot.
- 5 2. A device as claimed in claim 1, comprising an insole.
3. A device as claimed in claim 2, wherein said insole comprises a penetration resistant layer.
- 10 4. A device as claimed in claim 3, wherein said penetration resistant layer comprises a sheet of penetration resistant material.
5. A device as claimed in claim 4, wherein said sheet of material comprises a sheet of steel.
- 15 6. A device as claimed in claim 4, wherein said sheet of material comprises a sheet of fibre reinforced material.
7. A device as claimed in claim 3 wherein said penetration resistant layer comprises chain-mail.

8. A device as claimed in claim 3, wherein said penetration resistant layer comprises a fibre reinforced mesh.

5 9. A device as claimed in any one of claims 3 to 8, wherein said insole further comprises at least one layer of a substantially softer material.

10 10. A device as claimed in claim 9, wherein said at least one layer of softer material is arranged such that on insertion of the device into said shoe or boot said layer of softer material forms a contact surface for a foot of a wearer of said shoe or boot.

15 11. A device as claimed in any one of claims 3 to 10 wherein said penetration resistant layer is arranged such that it extends from a toe end of the device to a mid-sole portion thereof.

12. A device as claimed in any one of claims 1 to 11, comprising a toe cap.

20 13. A device as claimed in claim 12 when appended to any one of claims 2 to 11, wherein said insole and toe cap are integral.

14. A device as claimed in claim 12 or 13, wherein said toe cap is crush resistant.

15. A device as claimed in claim 14, wherein said toe cap is made of steel.

5      16. A device as claimed in claim 15 wherein said toe cap further comprises a lining of a softer material than steel.

17. A device substantially as hereinbefore described with reference to the accompanying drawings.

10      18. A shoe or boot provided with a removably insertable reinforcement device as claimed in any one of the preceding claims.

**Patents Act 1977**  
**Examiner's report to the Comptroller under**  
**section 17 (The Search Report)**

Application number

9202926.3

**Relevant Technical fields**

(i) UK Cl (Edition K ) A3B

(ii) Int Cl (Edition 5 ) A43B

Search Examiner

J GRAHAM

**Databases (see over)**

(i) UK Patent Office

(ii)

Date of Search

12.3.92

Documents considered relevant following a search in respect of claims

1-18

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 2205480 A (RAOUL) see eg page 4 lines 3-15	1-5,9-11, 18
X	GB 2009587 A (DAVIDSON) see eg page 2 lines 62,63	1,3,4,9, 18
X	GB 1258199 (RICKER) whole document	1,3,4,18
X	GB 1220846 (ELKINS) whole document	1-5,9-16 18
X	GB 756589 (NORDAHL) see particularly lines 35,36 and 45-47	1-5,9-16 18
Y	EP 0239313 (HASKEN) see eg column 4 lines 11-31	6

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Category	Identity of document and relevant passages	Relevant to claim(s)

### Categories of documents

**X:** Document indicating lack of novelty or of inventive step.

**Y:** Document indicating lack of inventive step if combined with one or more other documents of the same category.

**A:** Document indicating technological background and/or state of the art.

**P:** Document published on or after the declared priority date but before the filing date of the present application.

**E:** Patent document published on or after, but with priority date earlier than, the filing date of the present application.

**&c:** Member of the same patent family, corresponding document.

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